

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

written opinion

rapporteren aan client:

19-5-05

indien nodig gewijzigde versie van bij EPO:

PCT 24-7-05

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/NL2004/000641

International filing date (day/month/year)
16.09.2004

Priority date (day/month/year)
24.09.2003

International Patent Classification (IPC) or both national classification and IPC
G01L5/00, G06F15/00

Applicant
AB SKF

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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Best Available Copy

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**International application No.
PCT/NL2004/000641**Box No. I Basis of the opinion**

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing:
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
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Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	1-13
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

2. Citations and explanations

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/NL2004/000641

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following document/s/:

D1 : US 2002/057856 A1 (BAILEY ET AL) 16 May 2002 (2002-05-16)

D2 : US 5 952 587 A (RHODES ET AL) 14 September 1999 (1999-09-14)

D3 : ALGUINDIGUE I E ET AL: "MONITORING AND DIAGNOSIS OF ROLLING

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1. Novelty:

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows a method for determining real time load values experienced by a roller bearing. The use of a plurality of strain gauges is described to calculate ratios of applied loads and measured strains from which error equations are calculated using regression

analysis. The equations are used to calculate the real time loads.

The subject matter of claim 1 differs from this known method of D1 in that a deformation of the bearing is calculated from $N/2$ Fourier terms and fed to a trained bearing neural network which provides the load vector.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

2. Inventive step:

The problem to be solved by the present invention may be regarded as to determine the complete loading vector in all orthogonal dimensions on a roller bearing with improved accuracy.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

D1 discloses the use of a plurality of strain sensors and calculating the total load by solving a number of equations. However it does not mention the calculation of $N/2$ Fourier terms (N being the number of sensors) presenting a radial mode shape of the ring element.

As none of the documents or their combinations directly leads to the invention as described in claim 1 (without knowledge of the application) an inventive step is acknowledged.

Claims 2-6 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Claim 7 discloses a sensor arrangement corresponding to claim 1 and is therefore novel and inventive as well.

Claims 8-13 are dependent on claim 7 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

3. Industrial application

Industrial applicability of the subject-matter of Claims 1-13 (Article 34(4)(a)(I) PCT) is confirmed.

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